



CWA

Practical Solutions to Reducing Dust at Operating Terminals

Presented at:

2019 International Dry Bulk Terminals Group Operational and Technical Seminar
Southampton, UK

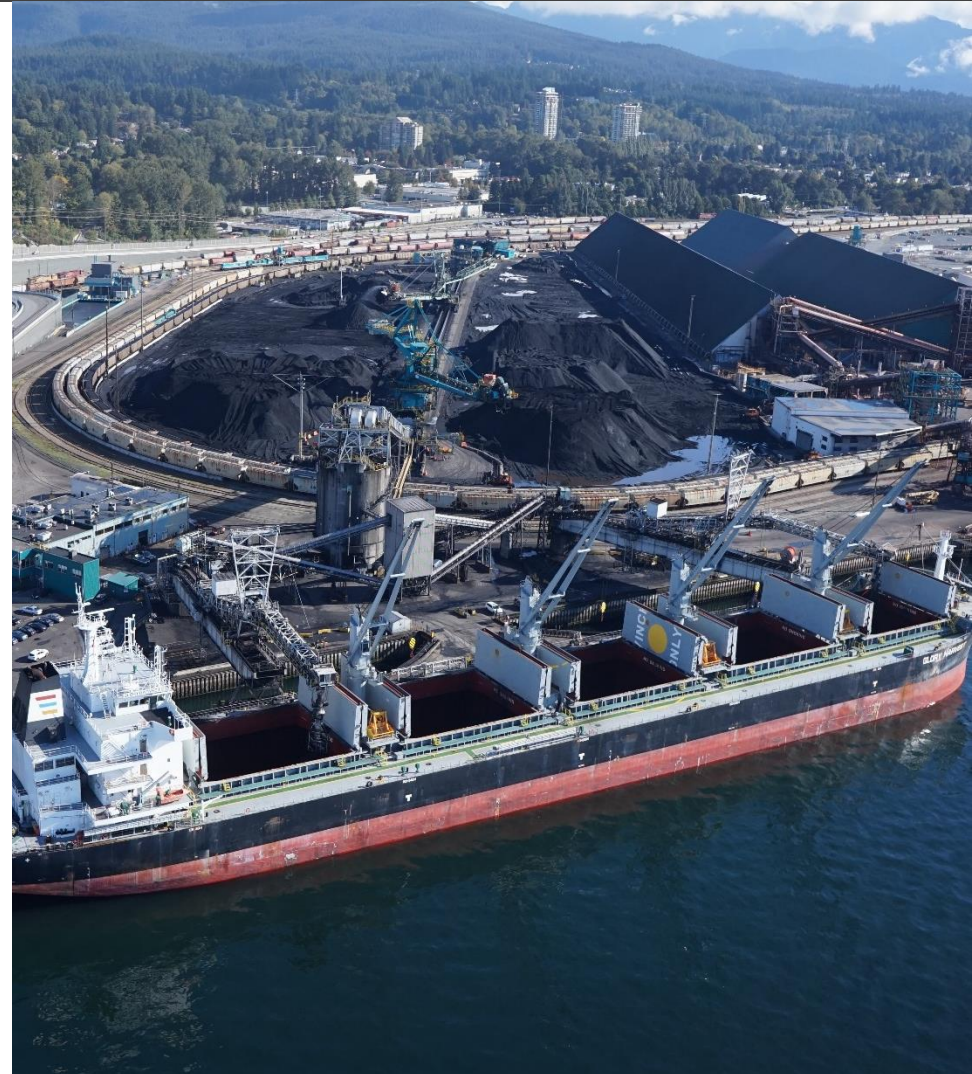
Presented by:

Steven Yee, P.Eng., M.A.Sc.
Vice President, Engineering & Development

CWA ENGINEERS INC. | EXPERTISE. INNOVATION. RESULTS.

Background

- In recent years, dust management has become an increasingly important health, safety, and environmental concern.
- Dust management is particularly important at ports and marine terminals because of their proximity to the water and, often, to residential areas.
- Dust management solutions can reduce harmful emissions and health concerns, mitigate explosion hazards, and prevent product loss.



Definitions


- **Active dust control:** methods used to suppress or collect fugitive dust generated by the material handling process.
- **Passive dust control:** methods used to prevent the generation of fugitive dust.




A photograph of an industrial facility, likely a steel mill or refinery, featuring a large overhead crane structure, a train of blue railcars, and various industrial buildings and walkways. The scene is captured during the "blue hour" of twilight, with a soft, dim light. The crane is a complex lattice structure with a large hook suspended from it. The train consists of several blue railcars on tracks that recede into the distance. The overall atmosphere is industrial and somewhat somber due to the low light.

General Approach and Recommendations

General Approach



Perform a site dust assessment.



Prioritize the issues.




Identify areas for immediate implementation.



Identify options for further study.



Further define the design criteria/scope of work as required.



Align the solutions with any budget constraints.



Select options for implementation and develop an overall implementation strategy.



Perform the detailed design.



Establish an implementation strategy for each project.



Construct the solution(s).



Perform close-out including testing.

General Recommendations

- Implement passive dust control measures to prevent the dust from being generated, then implement active dust control techniques.
- Establish a baseline for the current system with respect to the dust issues.
- Identify an appropriately-defined goal for what is considered an acceptable end result.
- Follow a phased implementation approach that implements solutions area by area and addresses the areas of highest importance first.

A photograph of an industrial facility, likely a steel mill or mining operation, featuring a large crane structure and conveyor belts. The scene is dimly lit, suggesting dusk or dawn. The crane is a complex metal structure with yellow railings and a large hook. The conveyor belts are long and narrow, running parallel to each other. The overall atmosphere is industrial and somewhat somber due to the low light.

Passive Dust Control Methods

CWA ENGINEERS INC. | EXPERTISE. INNOVATION. RESULTS.

Well-Designed Conveyor Systems

- Choose the appropriate conveyor speed for the product
- Ensure that seals are properly designed
- Ensure that the conveyor vertical inclines are appropriately sized for the material
- Ensure that transfers are properly designed.

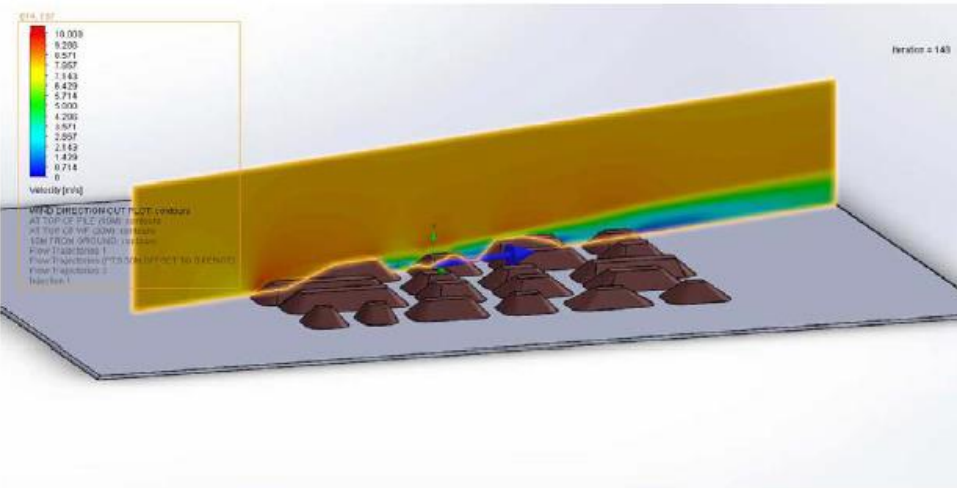


Wind Fences

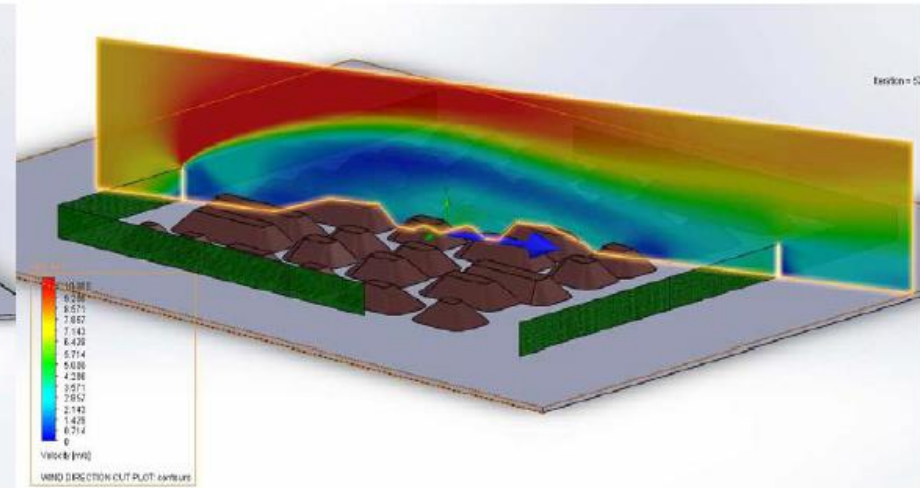


Photo courtesy of Dust Solutions Inc.

Wind Fences

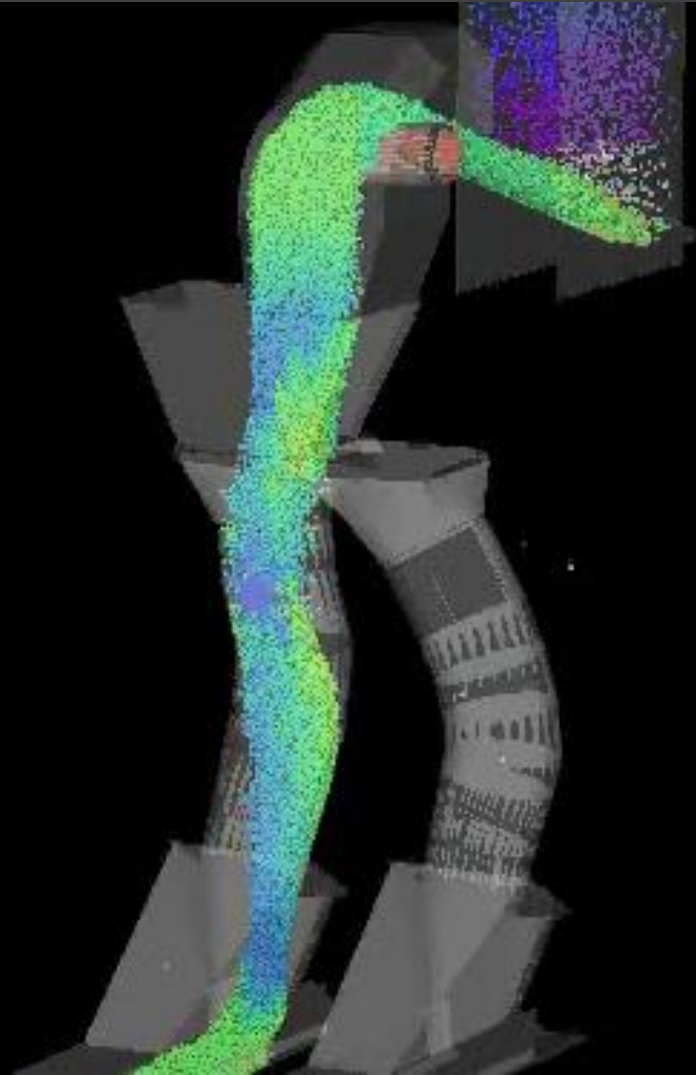
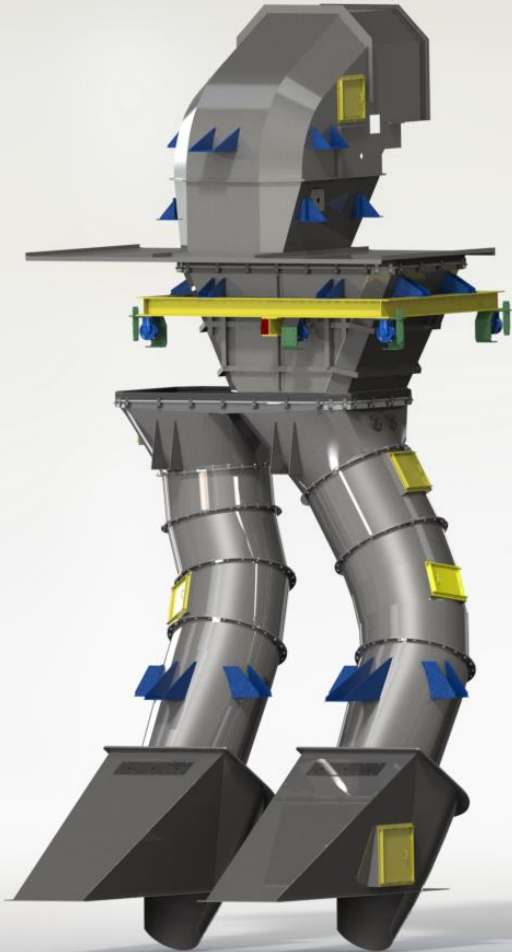


Without Fence

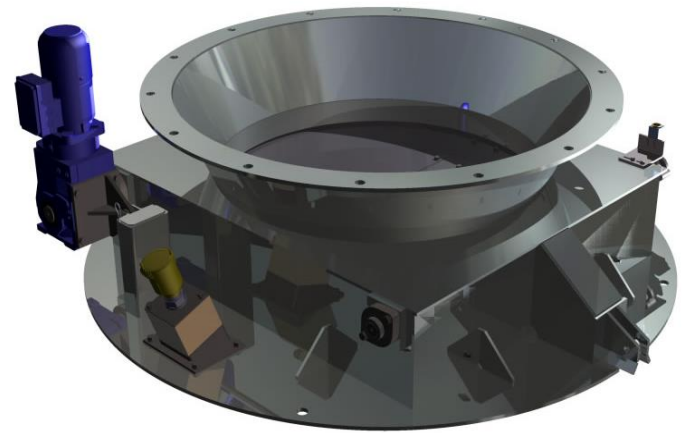


With Wind Fence

Soft-Handling Transfers

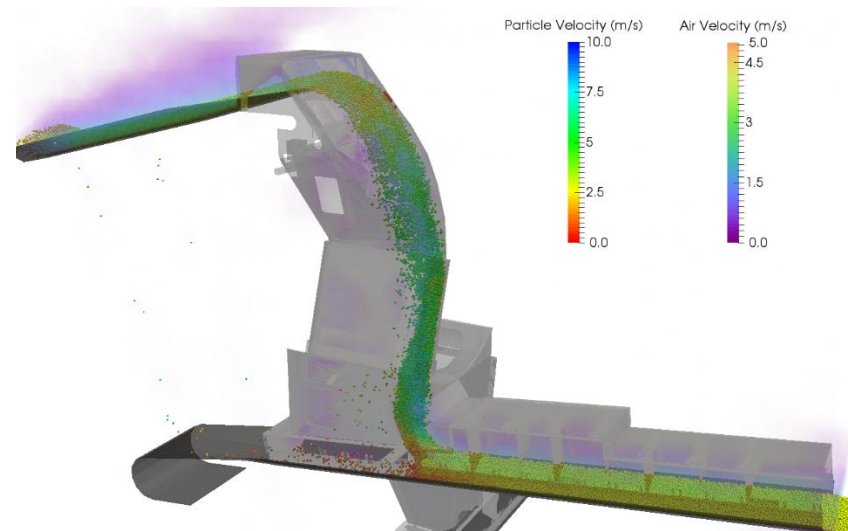
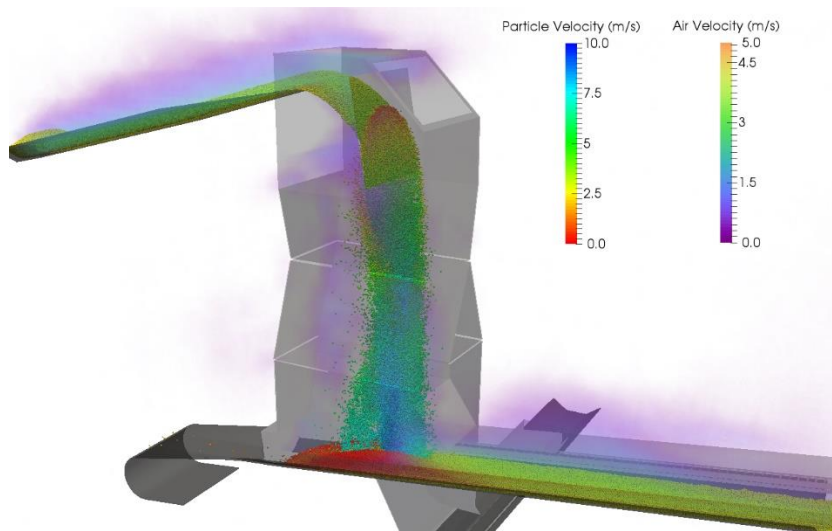


Soft-Handling Transfers



Soft-Handling Transfers: DEM-CFD Coupling

- Discrete element method modelling and computational fluid dynamics
- Analysis of material flow and trajectories in bins and chutes, including the influence of moving surfaces
- Chutes and bins can be designed to reduce turbulence in the material flow, thus minimizing dust emissions and product degradation



A photograph of an industrial facility, likely a steel mill or refinery, featuring a large crane structure and conveyor belts. The scene is dimly lit, suggesting dusk or dawn. The crane has a large hook and is positioned over a series of tracks or conveyor belts. The overall atmosphere is industrial and somewhat somber due to the low light.

Active Dust Control Methods

CWA ENGINEERS INC. | EXPERTISE. INNOVATION. RESULTS.

Dust Sprays



Fogging Systems



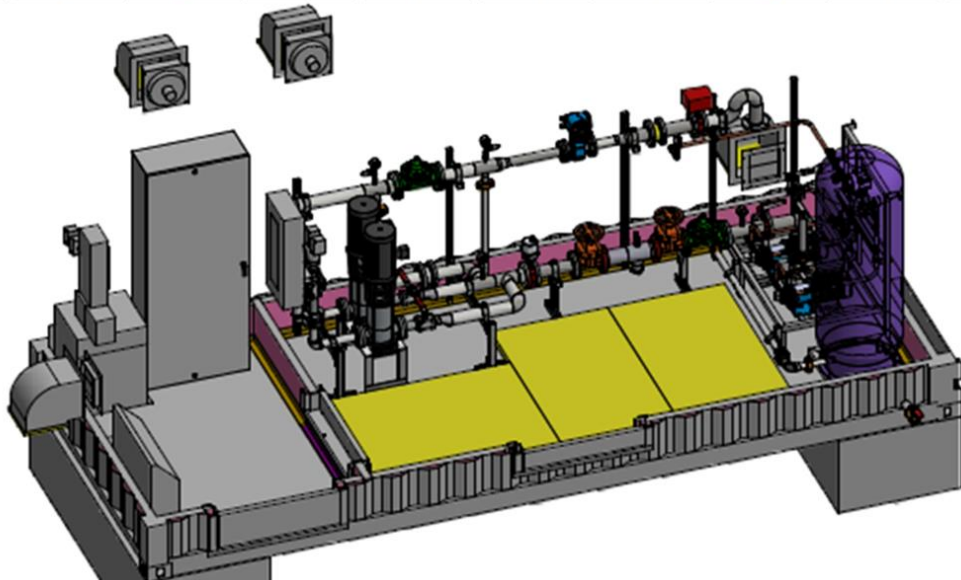
Chemical Systems



Chemical Systems



Chemical Systems



Enclosed Systems



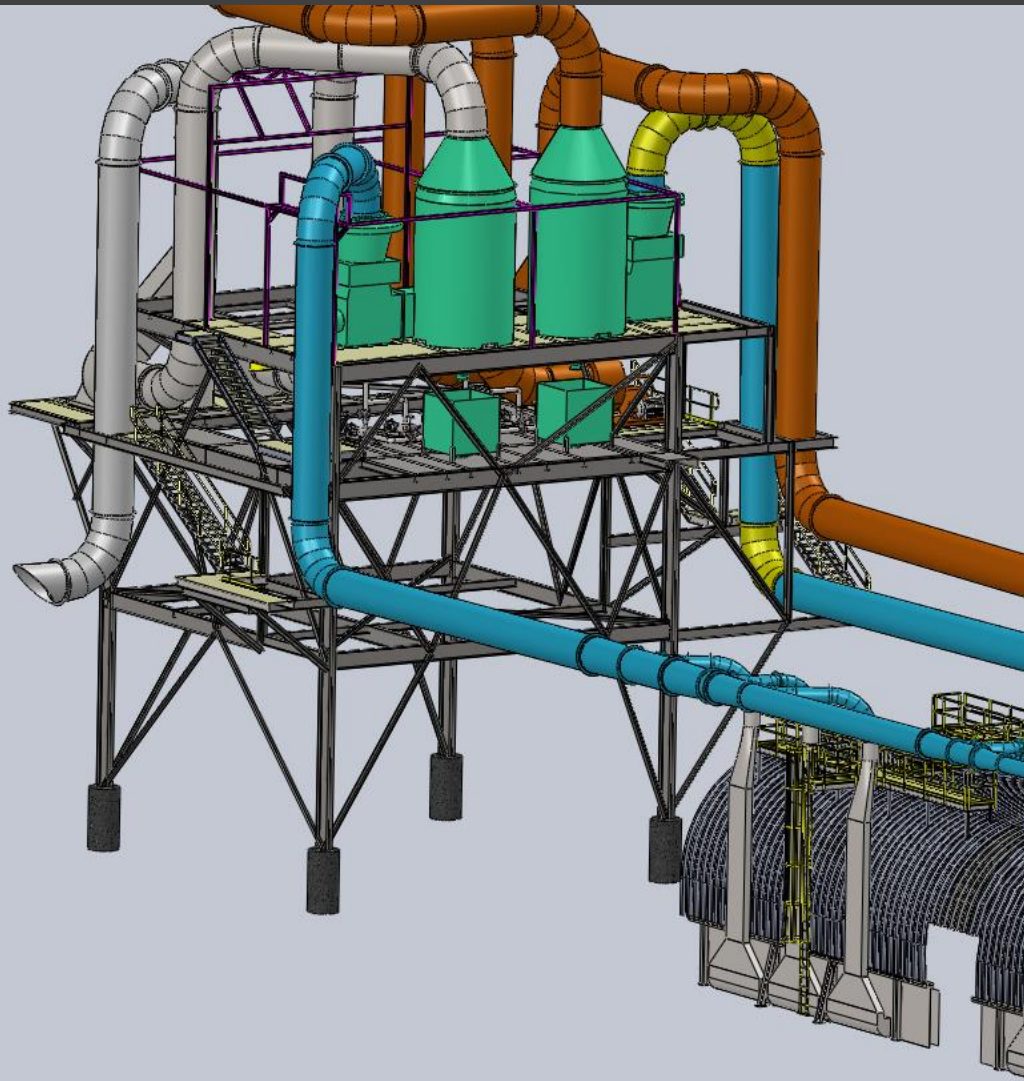
Dust Collection (Baghouses)



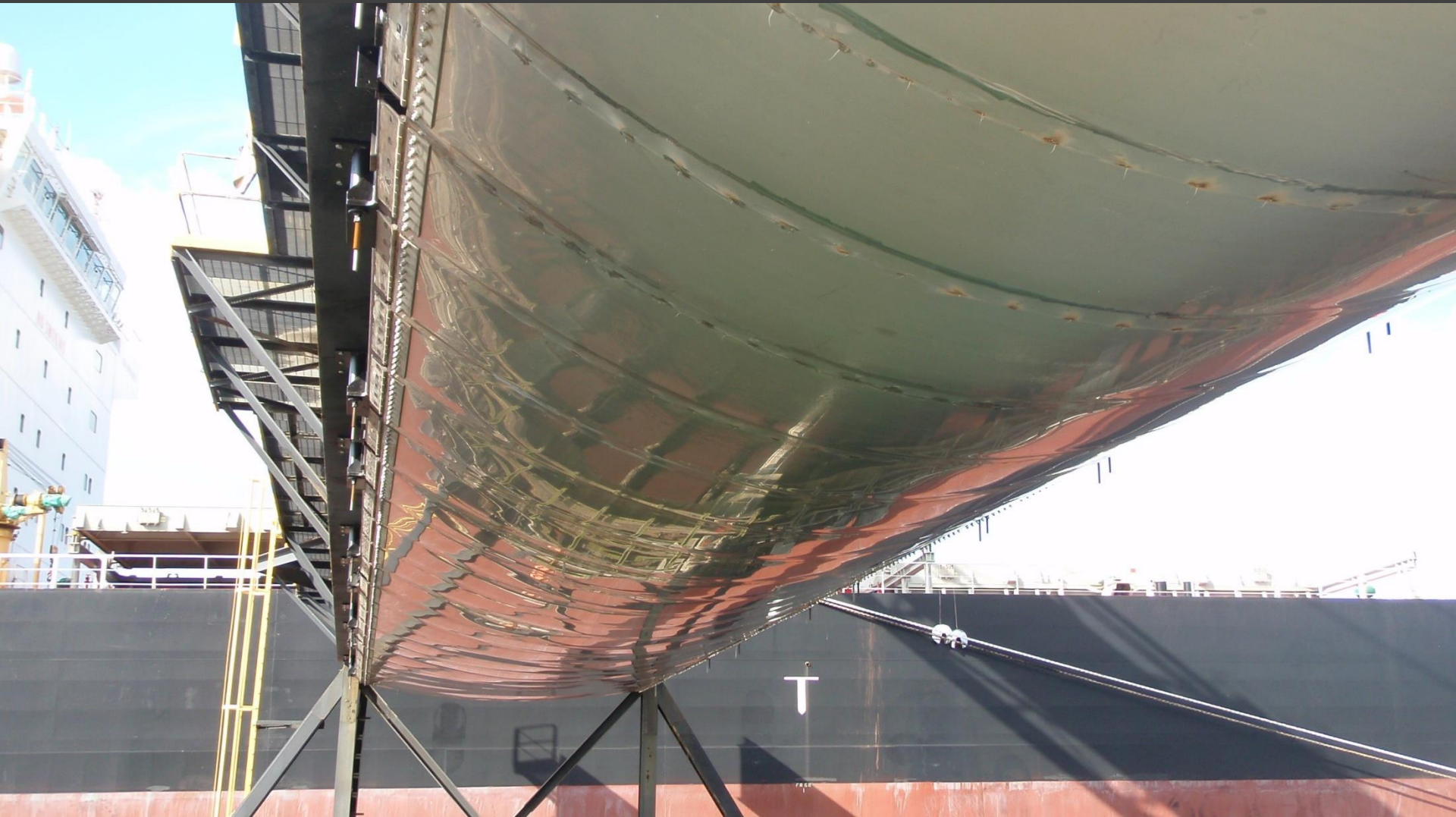
Dust Collection (Cyclones)



Dust Collection (Wet Scrubbers)



Spill Trays



Washdown Systems





Case Studies

CWA ENGINEERS INC. | EXPERTISE. INNOVATION. RESULTS.

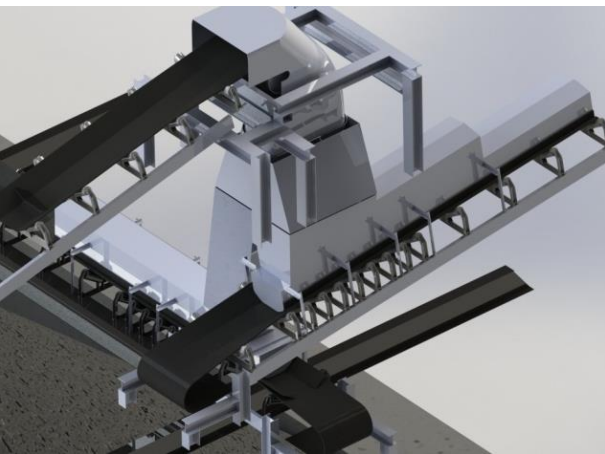
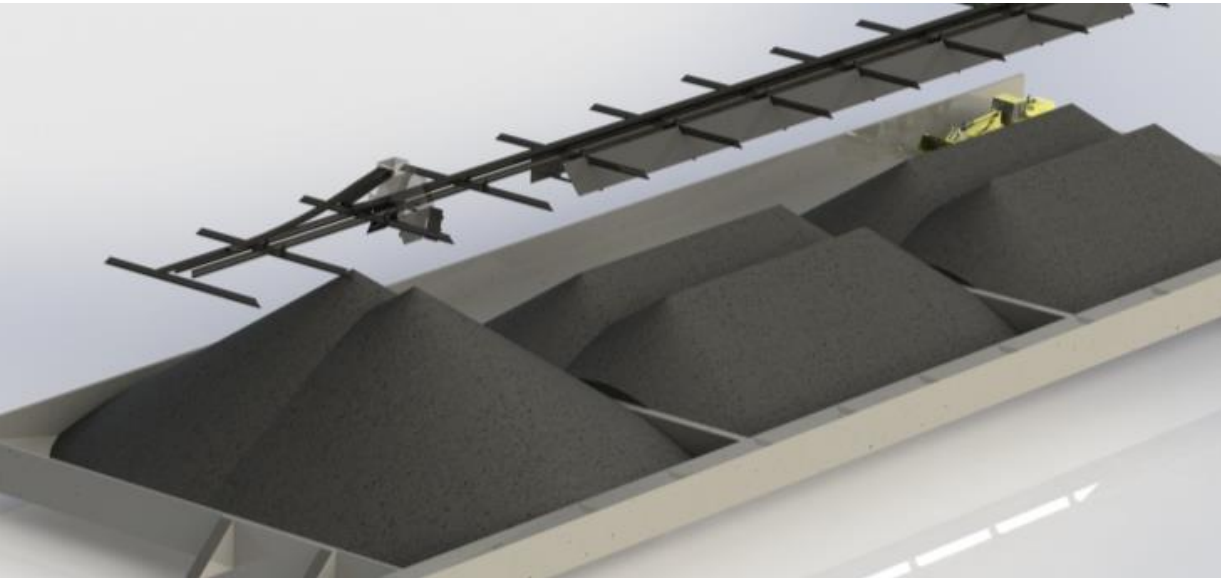
A photograph of an industrial facility, likely a wharf or port, during dusk. The scene is dominated by large, complex metal structures, including a prominent crane with a large bucket suspended from it. The sky is a deep blue, and the lighting is dim, with some artificial lights visible. The overall atmosphere is industrial and somewhat somber.

Case Studies

Passive Dust Control: Vancouver Wharves

LEAD HANDLING & STORAGE FACILITY MODIFICATIONS

Kinder Morgan Canada Terminals Ltd. | North Vancouver, BC, Canada

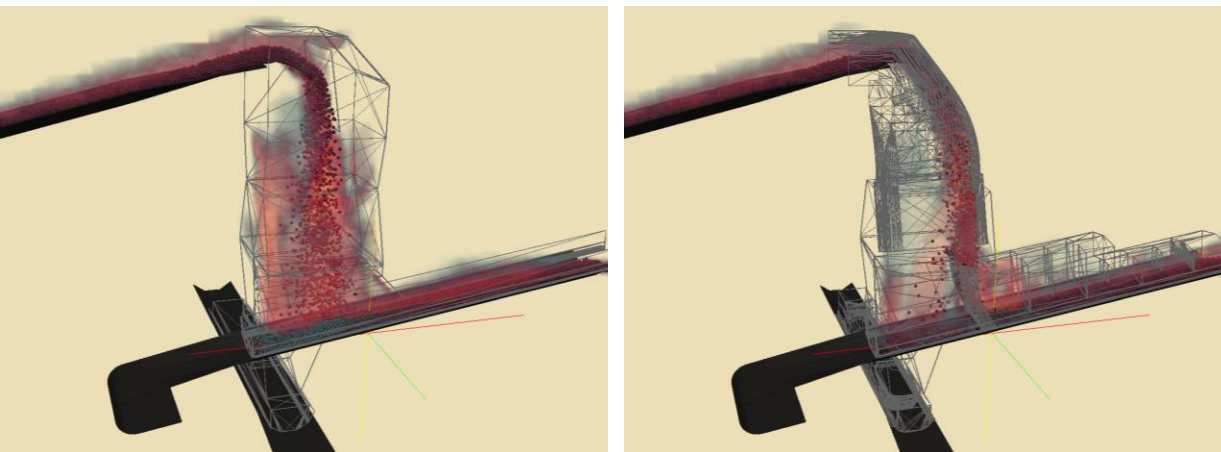


Project Highlights

- Optimization of existing arrangement to maximize stockpile volume
- Redesign of two conveyor transfers incorporating soft-handling chutes and sealed impact zones to minimize spillage and escape of dust
- Redesign of the retaining walls within the shed
- Increase of 60% to the stockpile volume

COUPLED CFD & DEM CHUTE ANALYSIS

Kinder Morgan Canada Terminals Ltd. | North Vancouver, BC, Canada



Project Highlights

- Significant amounts of dust were leaked during ship unloading
- Water sprays and vacuum systems were not an option
- Only potential solution: design a chute that generates less dust
- Coupled CFD and DEM analysis to check potential chute designs
- Original and new chute geometry modelled in SolidWorks

A photograph of an industrial facility, likely a wharf or port, during dusk. The scene is dominated by large, complex metal structures, including a prominent crane or conveyor system in the center. The sky is a deep blue, and the lighting is dim, with some artificial lights visible. The overall atmosphere is industrial and somewhat somber due to the low light.

Case Studies

Active Dust Control: Vancouver Wharves

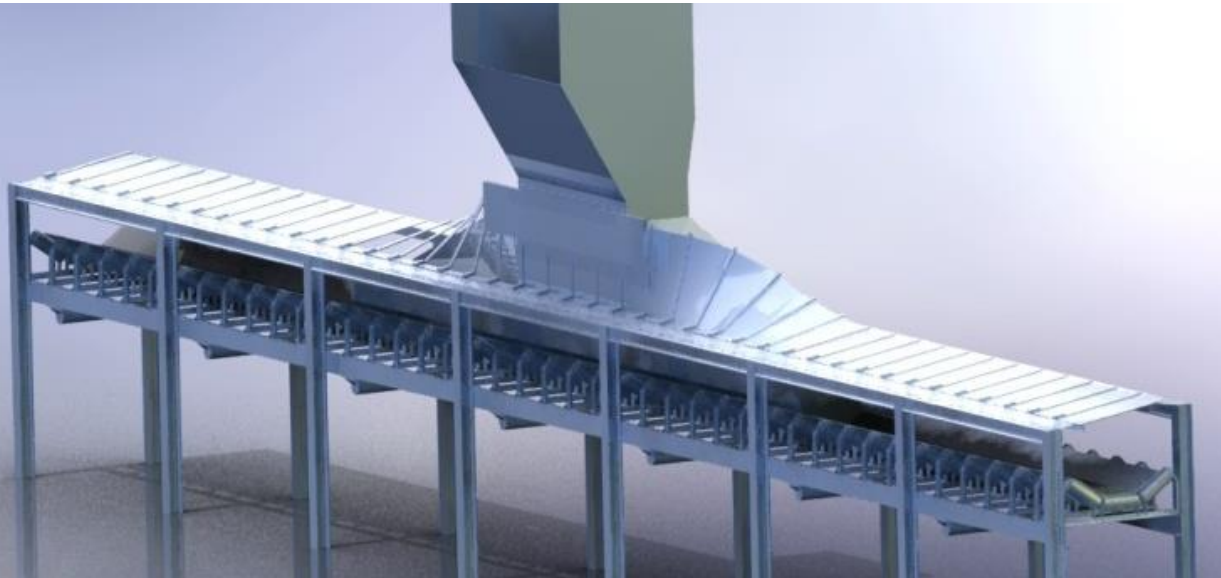
LEAD & ZINC UNLOADING SYSTEM REHABILITATION

Kinder Morgan Canada Terminals Ltd. | North Vancouver, BC, Canada



LEAD & ZINC UNLOADING SYSTEM REHABILITATION

Kinder Morgan Canada Terminals Ltd. | North Vancouver, BC, Canada



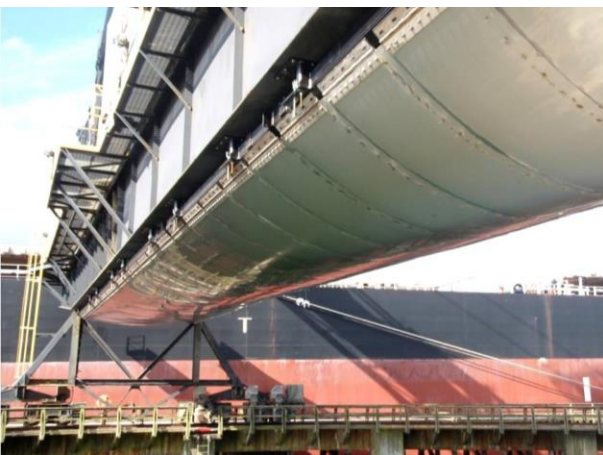
Project Highlights

- Replaced vibratory feeder with a belt feeder
- New fully-enclosed dedicated unloading conveyor system
- Innovative horizontal conveyor dust seal allows ship unloader to travel while minimizing dust emissions
- Improvements to the hopper area
- Dust collection and washdown collection



SHIPLOADER SPILL CONTAINMENT PANS

Kinder Morgan Canada Terminals Ltd. | North Vancouver, BC, Canada



Project Highlights

- Innovative concept to collect, monitor, discharge, and recycle spilled product
- Lightweight stainless steel “hanging curtain”-style containment pans
- Electronic load measuring of material captured by containment pans
- Combination of manual and automatic washdown system for containment pans
- Self-contained launder system allows product to be recycled



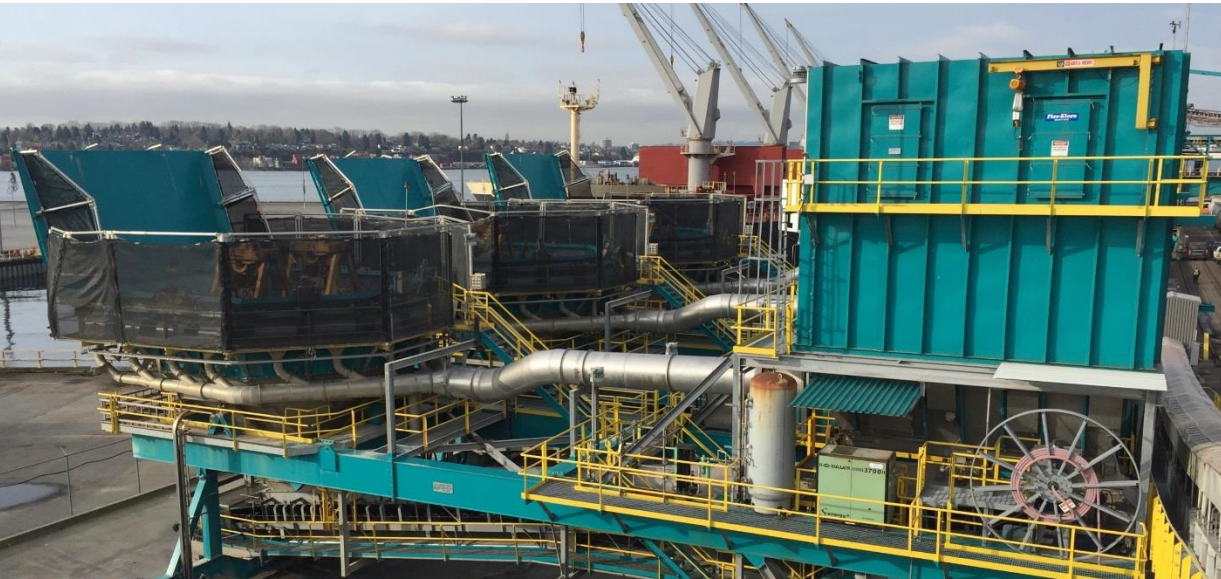
Case Studies

Active Dust Control: Neptune Bulk Terminals

CWA ENGINEERS INC. | EXPERTISE. INNOVATION. RESULTS.

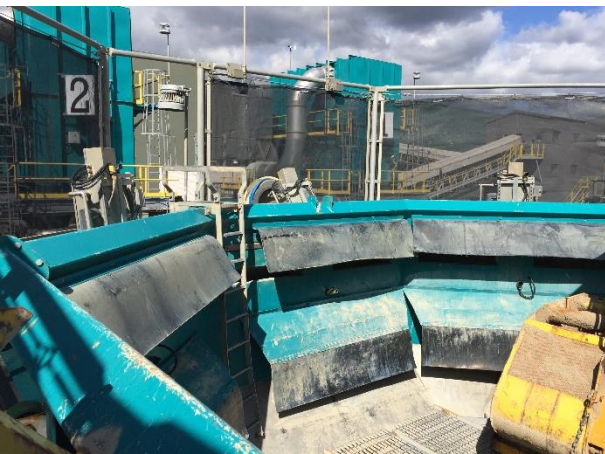
PHOSROCK HOPPER DUST CONTROL

Neptune Bulk Terminals (Canada) Ltd. | North Vancouver, BC, Canada



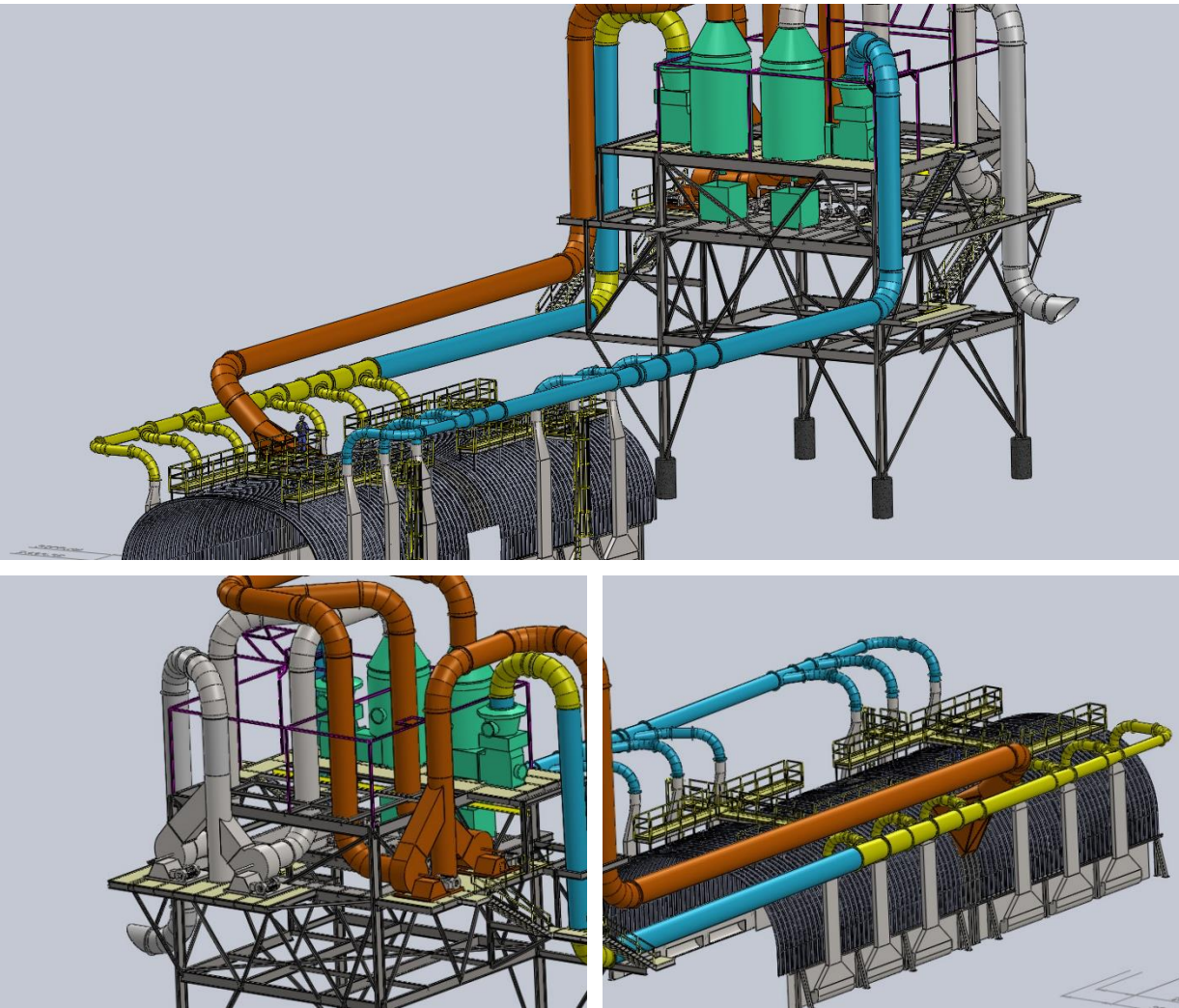
Project Highlights

- Wet scrubber system with ducting
- Wind fence and fogging system
- Large size relative to grab bucket size
- Flat removeable grizzly with baffles and low drop height



COAL WET SCRUBBERS DESIGN

Neptune Bulk Terminals (Canada) Ltd. | North Vancouver, BC, Canada



Project Highlights

- Multidisciplinary design of two new wet particulate scrubber systems for a new tandem railcar dumper
- Equipment specifications and performance requirements
- Each system consists of (a) wet scrubber(s), fans and drive assembly, pumps and drive assembly, slurry tanks, mist eliminators, stack, backflow gates, guards, dust shroud, and control devices

Other Projects Completed by CWA

- ✓ Coal-fired power station dust collection system upgrade study
- ✓ Stack/reclaimer chute replacement and spillage/plugging minimization
- ✓ New dust collection system for copper mine pebble crushing building
- ✓ Petroleum coke handling dust review
- ✓ Lead mine dust mitigation assessment and improvements
- ✓ Heavy metal concentrate containment
- ✓ Copper/gold mine dust collection study
- ✓ Coal mine conveyor improvements to minimize dust and spillage
- ✓ Sulphur conveyor modifications
- ✓ Copper mine dust control, ventilation, and thermal equilibrium
- ✓ Coal-fired power station loading zone dust and spillage improvements
- ✓ Alumina conveyor modifications
- ✓ Stockpiling stacker dust containment improvements
- ✓ Wood chip conveyor dust control
- ✓ Dust collection system upgrades for the construction of a hydroelectric generating station
- ✓ Sawdust cyclone explosion venting
- ✓ Wood pellet storage and loading system dust control



**Thank you!
Any questions?**